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Deformation history of brecciate serpentinite from the Omachi Seamount, Izu-Bonin arc

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The Omachi Seamount is located at 29°02'-30°N, 140°35'-55'E, ~20 km to the east of volcanic front of the Izu-Bonin arc, and is terminated to the west by a normal fault of the Quaternary rift system. Serpentinite is exposed along the foot of the fault scarp, at 3500-3100 m below sea level, and is overlain by andesitic volcanic rocks and turbidite. Floated rocks of eclogite facies were collected at the northernmost section of the serpentinite body.

Two samples, 6K #1064 R-014 and 6K #1066 R-024, were used in this study. Both have brecciate structures. 6K #1064 R-014 exhibit block-in-matrix structure with weak shape preferred orientation of long axes of blocks. This sample consists dominantly of antigorite with small amount of diopside and magnetite. Minor talc is present in the matrix, that exhibit brittle deformation textures and wavy extinction. These observations suggest shear deformation at shallow crustal levels-seafloor, and the deformation was probably caused by the Quaternary rifting.

6K #1066 R-024 is composed of assemblage of blocky serpentinite (crysotile, lizardite) which was originally olivine megacryst, schistose antigorite serpentinite, magnetite, and calcite. Calcite veins with various orientations were developed, and accompanied crystals of perovskite (CaTiO₃) and apatite. Based on mesoscopic and microscopic observations and results of chemical analysis, the following deformation history was established. 1: crystallization of olivine megacryst to form dunite, 2: development of schistose serpentinite at high temperature, 3: serpentinitization of dunite at low temperature, 4: expansion and fracturing by stress release due to exhumation, 5: crystallization of calcite, perovskite, and apatite along the fracture surface.